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TITLE: OPTICAL PICKUP DEVICE

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INVENTOR-INFORMATION:

NAME	COUNTRY
TERAGAKI, YASUKO	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
SANYO ELECTRIC CO LTD	N/A

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide an optical pickup device capable of reproducing a CD-R or a DVD and a magneto-optical recording medium in compatible fashion without any reduction in a reproducing characteristic.

SOLUTION: This optical pickup device 10 includes a light source 1, a first optical element 2, a correcting plate 11, a half mirror 3, a collimator lens 4, a second optical element 5, an objective lens 6, Wollaston prism 8 and a photodetector 9. The light source includes a first semiconductor laser 1A for a wavelength of 650 nm and a second semiconductor laser 1B for a wavelength of 780 nm, and the first and second semiconductor lasers are selectively driven by a laser driving circuit 100. The first optical element corrects optical axis

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical pickup equipment which plays two or more kinds of optical disks using two or more laser beams from which wavelength differs.
[0002]
[Description of the Prior Art] The optical disk with a thickness of about 1.2mm which reads information using semiconductor laser like CD-ROM is offered. In this kind of optical disk, by performing a focus servo and a tracking servo to the objective lens for pickup, a laser beam is made to irradiate the pit train of a signal recording surface, and the signal is reproduced.
[0003] Moreover, it has the same recording density as CD, and CD-R recordable only once is going to be put in practical use. Furthermore, recently, the high density for recording a prolonged animation is progressing. For example, DVD which records the information on 4.7Gbytes(es) on the same optical disk with a diameter of 12cm as CD-ROM on one side is released. The disk thickness of DVD is about 0.6mm, and can record the information on 9.4Gbytes(es) for this by one sheet by double-sided lamination ******.
[0004] Furthermore, short wavelength-ization of the laser beam used for playback of a signal also advances, and the blue laser which has the wavelength of 400-500nm with wavelength shorter now than the laser beam with a wavelength of 635nm mainly used is also developed. Therefore, a pit is still smaller than current DVD, utilization of DVD of the next generation also with a narrow track pitch is expected, and it will be assumed from now on that the distance from the substrate front face to a signal recording surface is set to 0.6mm or less.
[0005] Furthermore, it is rewritable, and the magneto-optic-recording medium attracts attention as a reliable record medium, and it is beginning to be put in practical use as a computer memory etc., and greatly [storage capacity], standardization of the magneto-optic-recording medium of 6.0Gbytes(es) is also going to be advanced, and, recently, storage capacity is going to be put in practical use. MSR (Magnetically Induced Super resolution) which detects the magnetic domain which playback of the signal from this magneto-optic-recording medium formed the detection aperture in the playback layer so that only that imprinted magnetic domain could be detected, while imprinting the magnetic domain of the recording layer of a magneto-optic-recording medium to a playback layer by irradiating a laser beam, and was imprinted from that formed detection aperture -- it is carried out by law. And the laser beam with a wavelength of 600-700nm is used for record and/or playback of the signal to this magneto-optic-recording medium. It is assumed that the blue laser which has the wavelength of the range of 400-500nm will be used also in record and/or playback of the signal to a magneto-optic-recording medium from now on.
[0006] If an example is taken by these situations, it is assumed that CD, CD-R, DVD, next-generation DVD, and a magneto-optic-recording medium will coexist in the future, compatible playback of these optical disks is carried out, and the optical pickup equipment which can record a signal is needed for a recordable optical disk.
[0007]
[Problem(s) to be Solved by the Invention] However, the record film used for CD-R has the peak of a reflection factor near the wavelength of 780nm, as shown in drawing 27 , and if its reflection factor is very as low as 10% or less and a laser beam with a wavelength of 635nm is used for it by the short wavelength and long wavelength side from 780nm, it has the problem that neither record nor playback can be performed to CD-R. Therefore, compatible playback with CD-R and DVD cannot be performed only by the laser beam with a wavelength of 635nm.
[0008] Although it is possible to carry the semiconductor laser which generates a laser beam with a wavelength of 635nm, and the semiconductor laser which generates a laser beam with a wavelength of 780nm in one optical pickup equipment in order to solve this problem In that case, since the optical axis

of the laser beam generated from two semiconductor laser has shifted, when the shaft of optical system is made in agreement with the optical axis of one laser beam, there is a problem that the reproducing characteristics at the time of using the laser beam of another side fall.
[0009] Moreover, in order to perform signal regeneration from a magneto-optic-recording medium, it is necessary to irradiate the laser beam of the linearly polarized light at a magneto-optic-recording medium. Then, the invention in this application aims at offering the optical pickup equipment which can carry out compatible playback of CD-R and/or DVD, and the magneto-optic-recording medium, without reproducing characteristics falling.
[0010]
[The means for solving a technical problem and an effect of the invention] Invention concerning claim 1 is optical pickup equipment containing a laser beam generation means, the 1st optical element, the 2nd optical element, the 3rd optical element, and the 4th optical element in the optical pickup equipment which carries out convergent radiotherapy of the laser beam to an optical recording medium with an objective lens, leads the reflected light in an optical recording medium to a photodetector, and records and/or reproduces a signal.
[0011] A laser beam generation means generates alternatively the 1st laser beam which has the 1st wavelength, and the 2nd laser beam which has the 1st wavelength and the 2nd different wavelength. Moreover, the 1st optical element amends the optical-axis gap with the 1st laser beam and the 2nd laser beam which were generated by the laser beam generation means. Moreover, the 3rd optical element carries out incidence of the 1st and 2nd laser beams from the 1st optical element, and changes the 1st laser beam into the linearly polarized light substantially at least.
[0012] Moreover, the 2nd optical element penetrates the 1st laser beam as it is among the 1st and 2nd laser beams from the 3rd optical element, and it carries out incidence to an objective lens, and it shades the predetermined periphery section for the 2nd laser beam substantially, makes only the predetermined inner circumference section diffract, and carries out incidence to an objective lens. Moreover, the 4th optical element is divided into the laser beam in which the laser beam of only S polarization component, the laser beam of only P polarization component, and S polarization component and P polarization component were intermingled in the reflected light from an optical recording medium.
[0013] According to invention indicated by claim 1, since the optical-axis gap is amended by the 1st optical element and it is changed into the linearly polarized light by the 3rd optical element, the 1st and 2nd laser beams from which the optical axis shifted can carry out compatible playback of the magneto-optic-recording medium which detects the magnitude of the rotatory polarization angle of the laser beam in a signal recording surface, and reproduces a signal, and the other optical recording medium.
[0014] Moreover, in the optical pickup equipment with which invention concerning claim 2 was indicated by claim 1, the 1st optical element is optical pickup equipment which consists of the 1st parallel layer and 2nd parallel layer mutually. According to invention indicated by claim 2, since the 1st optical element which amends a gap of the optical axis of the 1st laser beam and the 2nd laser beam consists of the 1st parallel layer and 2nd parallel layer mutually, it can amend an optical-axis gap of a laser beam with an easy configuration.
[0015] In the optical pickup equipment with which invention concerning claim 3 was indicated by claim 2 moreover, the 1st layer While reflecting the 1st laser beam, carrying out incidence to the 2nd optical element and making the 2nd laser beam refracted to the 2nd layer The reflected light in the 2nd layer of the 2nd laser beam is made refracted so that it may become the reflected light in the 1st layer of the 1st laser beam, and the same axle, incidence is carried out to the 2nd optical element, and the 2nd layer is optical pickup equipment which reflects in the 1st layer the 2nd laser beam refracted in the 1st layer.
[0016] According to invention indicated by claim 3, reflection and refraction of an alternative laser beam can amend an optical-axis gap of a laser beam. Moreover, invention concerning claim 4 consists of the cascade screen to which the 1st layer carried out the laminating of the 1st thin film and 2nd thin film by turns, and the 2nd layer is optical pickup equipment which consists of the cascade screen which carried out the laminating of the 3rd thin film and 4th thin film by turns.
[0017] According to invention indicated by claim 4, since the 1st layer and 2nd layer which constitute

the 1st optical element consist of a cascade screen, they can produce the 1st optical element easily. Moreover, invention concerning claim 5 is optical pickup equipment containing a laser beam generation means, the 1st optical element, the 2nd optical element, the 3rd optical element, the 4th optical element, and the 5th optical element in the optical pickup equipment which carries out convergent radiotherapy of the laser beam to an optical recording medium with an objective lens, leads the reflected light in an optical recording medium to a photodetector, and records and/or reproduces a signal.

[0018] A laser beam generation means generates alternatively the 1st laser beam which has the 1st wavelength, and the 2nd laser beam which has the 1st wavelength and the 2nd different wavelength. Moreover, the 1st optical element amends the optical-axis gap with the 1st laser beam and the 2nd laser beam which were generated by the laser beam generation means. Moreover, the 3rd optical element carries out incidence of the 1st and 2nd laser beams from the 1st optical element, and changes the 1st laser beam into the linearly polarized light substantially at least.

[0019] Moreover, the 2nd optical element penetrates the 1st laser beam as it is among the 1st and 2nd laser beams from the 3rd optical element, and it carries out incidence to an objective lens, and it shades the predetermined periphery section for the 2nd laser beam substantially, makes only the predetermined inner circumference section diffract, and carries out incidence to an objective lens. Moreover, the 4th optical element is reflected with an optical recording medium, and the 1st laser beam which penetrated the 1st optical element is substantially changed into the linearly polarized light.

[0020] Moreover, the 5th optical element is divided into the laser beam in which the laser beam of only S polarization component, the laser beam of only P polarization component, and S polarization component and P polarization component were intermingled in the laser beam from the 4th optical element. According to invention indicated by claim 5, since the optical-axis gap is amended by the 1st optical element and it is changed into the linearly polarized light by the 3rd optical element, the 1st and 2nd laser beams from which the optical axis shifted can carry out compatible playback of the magneto-optic-recording medium which detects the magnitude of the rotatory polarization angle of the laser beam in a signal recording surface, and reproduces a signal, and the other optical recording medium.

[0021] Moreover, in the optical pickup equipment with which invention concerning claim 6 was indicated by claim 5, the 1st optical element is optical pickup equipment which consists of the 1st parallel layer and 2nd parallel layer mutually. According to invention indicated by claim 6, since the 1st optical element which amends a gap of the optical axis of the 1st laser beam and the 2nd laser beam consists of the 1st parallel layer and 2nd parallel layer mutually, it can amend an optical-axis gap of a laser beam with an easy configuration.

[0022] Moreover, in the optical pickup equipment with which invention concerning claim 7 was indicated by claim 6, while the 2nd laser beam is made to penetrate substantially while the 1st layer carries out abbreviation one half reflection of the 1st laser beam, and the 2nd layer penetrates the 1st laser beam substantially, it is optical pickup equipment which carries out abbreviation one half reflection of the 2nd laser beam.

[0023] Since according to invention indicated by claim 7 abbreviation-one-half-reflect, or the 1st optical element penetrates a laser beam according to wavelength, amends the optical-axis gap with the 1st laser beam and the 2nd laser beam, carries out the abbreviation one half transparency of the reflected light in an optical recording medium and leads it to a photodetector, a big optic like a beam splitter is not needed, but compact optical pickup equipment can be produced.

[0024] Moreover, in the optical pickup equipment with which invention concerning claim 8 was indicated by claim 7, the 1st layer consists of the cascade screen which carried out the laminating of the 1st thin film and 2nd thin film by turns, and the 2nd layer is optical pickup equipment which consists of the cascade screen which carried out the laminating of the 3rd thin film and 4th thin film by turns.

[0025] According to invention indicated by claim 8, since the 1st layer and 2nd layer consist of a cascade screen, they can produce the 1st optical element easily.

[0026]

[Embodiment of the Invention] The gestalt of operation of the 1st of gestalt this invention of the 1st operation is explained referring to drawing. With reference to drawing 1 , the optical pickup equipment

concerning the invention in this application is explained. Optical pickup equipment 10 is equipped with the light source 1, the 1st optical element 2, a corrector plate 11, a half mirror 3, a collimator lens 4, the 2nd optical element 5, an objective lens 6, Wollaston prism 8, and a photodetector 9. The light source 1 consists of 1st semiconductor laser 1A which carries out outgoing radiation of the laser beam of wavelength 650(it is the same allowable-error**15 and the following.) nm, and the 2nd semiconductor laser 1B which carries out outgoing radiation of the laser beam of wavelength 780(it is the same allowable-error**15 and the following.) nm, and generates alternatively a laser beam with a wavelength of 650nm and a laser beam with a wavelength of 780nm by the laser drive circuit 100. In this application, the laser drive circuit 100 and the light source 1 are collectively called laser beam generation means. The 1st optical element 2 reflects a laser beam with a wavelength of 650nm and a laser beam with a wavelength of 780nm in the perpendicular direction to an optical recording medium 7 (or 77), and makes the optical axis of two laser beams in agreement. It is reflected by the 1st optical element 2 and a corrector plate 11 changes a laser beam with a wavelength of 650nm into the linearly polarized light substantially at least among a laser beam with a wavelength of 650nm which became elliptically polarized light, and a laser beam with a wavelength of 780nm. A half mirror 3 penetrates the laser beam from a corrector plate 11, and reflects the reflected light from an optical recording medium 7 (or 77) in the direction of a photodetector 9. A collimator lens 4 makes a laser beam parallel light. The 2nd optical element 5 penetrates a laser beam with a wavelength of 650nm as it is, shades the periphery section substantially to a laser beam with a wavelength of 780nm, diffracts only the inner circumference section, and it carries out incidence to an objective lens 6. An objective lens 6 condenses a laser beam and irradiates signal recording surface 7a (or 77a) of an optical recording medium 7 (or 77). Wollaston prism 8 divides the reflected light in an optical recording medium 7 (or 77) into the laser beam in which the laser beam of only S polarization component, the laser beam of only P polarization component, and S polarization component and P polarization component were intermingled. A photodetector 9 detects the laser beam in which the laser beam of only S polarization component, the laser beam of only P polarization component, and S polarization component and P polarization component were intermingled.

[0027] The 1st optical element 2 is explained with reference to drawing 2 , and 3, 4 and 5. With reference to drawing 2 , the 1st optical element 2 consists of the glass 23 which formed the 1st layer 21 in one principal plane, and the glass 24 which formed the 2nd layer 22 in one principal plane, and it is constituted so that the 1st layer 21 and 2nd layer 22 may become parallel mutually. Incidence of the 1st laser beam LB1 with a wavelength of 650nm and the 2nd laser beam LB2 with a wavelength of 780nm is carried out to the 1st optical element 2 from the 1st layer 21 side prepared in one principal plane of glass 23.

[0028] With reference to drawing 3 , it is almost reflected in the 1st layer 21, and the 1st laser beam LB1 turns into a laser beam LB3. In this case, since the phase contrast of 10.8 degrees produces the 1st laser beam LB1 for P polarization component and S polarization component by being reflected in the 1st layer 21, a laser beam LB3 turns into elliptically polarized light. Moreover, with reference to drawing 4 , the 2nd laser beam LB2 penetrates the 1st layer 21, and is reflected in the 2nd layer 22 which passed glass 23 and was prepared in one principal plane of glass 24. And again, it is refracted [be / it / under / glass 23 / passing] in the 1st layer 21, and becomes the laser beam LB3 which is the reflected light in the 1st layer 21 of the 1st laser beam LB1, and the same laser beam. In this case, the 2nd laser beam LB2 produces the phase contrast of 31.7 degrees for P polarization component and S polarization component by penetrating the 1st layer 21. Moreover, by being reflected in the 2nd layer 22, the 2nd laser beam LB2 does not produce phase contrast, but produces the phase contrast of 31.7 degrees by penetrating the 1st layer 21 again. Therefore, also when the phase contrast of 63.4 degrees will be produced and the 2nd laser beam LB2 is reflected by the 1st optical element 2 by reflecting the 2nd laser beam LB2 as a laser beam LB3, it becomes elliptically polarized light. Although the 1st optical element 2 changes a laser beam into elliptically polarized light from the linearly polarized light when reflecting the 1st laser beam LB1 and 2nd laser beam LB2 as a laser beam LB3, before carrying out incidence to the 1st optical element 2, it makes in agreement the optical axis of the 1st laser beam LB1 and the 2nd laser beam LB2

from which the optical axis had shifted.
[0029] The example of the 1st layer 21 is explained with reference to drawing 5 . The 1st layer 21 is the cascade screen which carried out the laminating of the three layers for the 2nd thin film 211 which consists the 1st thin film 210 which consists of TiO2 of four layers and MgF2 by turns. In this case, the thickness of the 1st thin film 210 sets the refractive index of TiO2 to 2.7, and is 51.8nm. Moreover, the thickness of the 2nd thin film 211 sets the refractive index of MgF2 to 1.38, and is 101nm. As shown in drawing 15 , the optical property to the laser beam with a wavelength [of the 1st layer 21] of 650nm and the laser beam with a wavelength of 780nm which were constituted as mentioned above reflects most laser beams with a wavelength of 650nm, and penetrates most laser beams with a wavelength of 780nm. In this case, as the incident angle to the 1st layer 21 also influences and it is shown in drawing 3 and 4, when the incident angle of a laser beam with a wavelength [to the 1st layer 21] of 650nm and a laser beam with a wavelength of 780nm is set to theta, in the case of drawing 15 , it is theta= 30 degrees.

[0030] Moreover, the 2nd layer 22 of the 1st optical element 2 consists of aluminum (aluminum), and the thickness is about 100nm. In this case, the 2nd layer 22 reflects a laser beam with a wavelength of 780nm which penetrated the 1st layer 21 80% or more. A corrector plate 11 amends the elliptically polarized light of the laser beam LB3 reflected by the 1st optical element 2 to the linearly polarized light. Specifically, a corrector plate 11 is sigma=(2 pi/lambda) (no-ne) d, when it consists of Xtal and wavelength of the laser beam which the thickness d ne(s) the refractive index of no and a perimeter for the phase contrast amended with a corrector plate 11, and amends the refractive index of sigma and Xtal is set to lambdanm..... (1)
It is come out and determined. In the case of sigma=349.2 degree, it is d=(69.8+72xm) mum (m= 0, 12 and 3, ..). In this case, they could be no-ne=0.00903 and lambda= 650nm.
[0031] A corrector plate 11 should just amend at least the elliptically polarized light of the laser beam with a wavelength of 650nm used for record and/or playback of the signal to a magneto-optic-recording medium to the linearly polarized light. Since CD and the laser beam used for record and playback of the signal of CD-R may be any of the linearly polarized light and elliptically polarized light, even if a laser beam with a wavelength of 780nm is changed into elliptically polarized light by the 1st optical element 2, it does not need to amend the elliptically polarized light by force. Therefore, in this application, the thickness of a corrector plate 11 is set as the thickness which amends the elliptically polarized light of the laser beam with a wavelength of 650nm used for record and/or playback of the signal to a magneto-optic-recording medium.
[0032] Next, with reference to drawing 6 , and 7, 8, 9, 10 and 11, the detail of said 2nd optical element 5 is explained. The 2nd optical element 5 consists of periphery section 5a and inner circumference section 5b. Periphery section 5a A laser beam with a wavelength of 650nm is penetrated extensively as it is, only a laser beam with a wavelength of 780nm is diffracted on the outside of an optical axis, and it has the function which does not carry out incidence to said objective lens 6. Inner circumference section 5b A laser beam with a wavelength of 650nm is penetrated extensively as it is, and it has the function which diffracts only a laser beam with a wavelength of 780nm and carries out incidence to said objective lens 6.
[0033] With reference to drawing 7 , periphery section 5a of the cross-section structure of the 2nd optical element 5 is concavo-convex structure, inner circumference section 5b is a triangle-like greatly, and the part equivalent to a triangular slant face is the small structure which became stair-like ((a) of reference drawing 7). The range of 8-12 micrometers is suitable, and the pitch L of the irregularity of said periphery section 5a can produce easily the structure with a triangular small slant face which became stair-like by etching glass. Moreover, not only the structure that shows the cross-section structure of said inner circumference section 5b in (a) of drawing 7 R> 7 but the structure to which the slant face became smooth as preferably shown in (b) of drawing 7 is suitable.
[0034] Moreover, with reference to drawing 8 and 9, the 2nd optical element 5 is still more desirable, periphery section 5a which consists of concavo-convex structure is prepared in one front face of glass, and inner circumference section 5b which consists of the shape of a triangle is prepared in the front face

of different another side from the front face in which said periphery section 5a was prepared. Production of the 2nd optical element 5 becomes easy by making it drawing 8 which forms said periphery section 5a and said inner circumference section 5b in a different front face, and the structure shown in 9.
[0035] With reference to drawing 10 , the function of the 2nd optical element 5 to a laser beam with a wavelength of 650nm is explained. Without being influenced in any way by the 2nd optical element 5, it penetrates as it is, incidence is carried out to an objective lens 6, it is condensed with an objective lens 6, and a laser beam with a wavelength of 650nm connects a focus to signal recording surface 7a of the optical disk of 0.6mm of substrate thickness. With reference to drawing 11 , the function of the 2nd optical element 5 to a laser beam with a wavelength of 780nm is explained. The part which carries out incidence to periphery section 5a among laser beams with a wavelength of 780nm is greatly diffracted by the outside of an optical axis by the diffraction grating, and does not carry out incidence to an objective lens 6. Moreover, although the laser beam which carries out incidence to inner circumference section 5b receives diffraction outside according to the shape of said triangle, like periphery section 5a, it does not receive big diffraction but it carries out incidence to an objective lens 6. Therefore, an objective lens 6 is reached, it is condensed with this objective lens 6, and only the laser beam which carries out incidence only to inner circumference section 5b of the 2nd optical element 5 connects a focus to signal recording surface 77a of the optical disk of 1.2mm of substrate thickness. That is, it is substantially shaded by the 2nd optical element and the zero-order light LB4 and the primary light LB5 carry out [the inner circumference section] incidence of the laser beam with a wavelength of 780nm to an objective lens 6 in response to diffraction. Since the objective lens 6 is designed for the optical disks of 0.6mm of substrate thickness, since aberration occurs when incidence is carried out to a substrate with a thickness of 1.2mm, it is for making this aberration small to make diffraction start by the 2nd optical element 5 to the inner circumference section of a laser beam with a wavelength of 780nm, and to generate the primary light LB5 only by shading the periphery section of a laser beam with a wavelength of 780nm. Therefore, the diameter of inner circumference section 5b of the 2nd optical element 5 and the magnitude of the shape of a triangle which makes diffraction start are determined so that the effectual numerical aperture of the objective lens 6 by the 4 or primary zero-order light LB light LB5 generated by diffraction may be set to 0.45. Moreover, when the signal record to CD-R is taken into consideration, since, as for the effectual numerical aperture of an objective lens 6, 0.50 is suitable, as for the diameter of inner circumference section 5b of the 2nd optical element 5, the effectual numerical aperture of an objective lens 6 is determined are set to 0.45-0.50.
[0036] In drawing 10 and explanation of 11, although said periphery section 5a and said inner circumference section 5b explained the optical element formed in the same front face, also when formed in the front face on which periphery section 5a differs from inner circumference section 5b, it cannot be overemphasized that it has the same function. Furthermore, said 2nd optical element 5 may have said objective lens 6 and structure which moves in one.
[0037] As explanation was given [above-mentioned], the 2nd optical element 5 originates in the difference in the wavelength of a laser beam, and a laser beam with a wavelength of 780nm is received. Shade the periphery section substantially, diffract the laser beam of the inner circumference section, and signal recording surface 77a of the optical disk of 1.2mm of substrate thickness is received in a focus at an epilogue and a laser beam with a wavelength of 650nm. It is the optical element with two foci of making it penetrating as it is and connecting a focus to signal recording surface 7a of the optical disk of 0.6mm of substrate thickness, without starting diffraction in any way.
[0038] With reference to drawing 12 , playback actuation of the magneto-optic-recording medium which is the optical disk of 0.6mm of substrate thickness is explained. When a magneto-optic-recording medium is reproduced, the selection drive of the 1st semiconductor laser 1A which generates a laser beam with a wavelength of 650nm by the laser drive circuit 100 is carried out. Consequently, a laser beam with a wavelength of 650nm is reflected in the 1st layer 21 of the 1st optical element 2, as explanation was given [above-mentioned]. A laser beam with a wavelength of 650nm reflected by the 1st optical element 2 is amended by the linearly polarized light from elliptically polarized light with a corrector plate 11, and carries out incidence to a half mirror 3. In this case, what is necessary is to just be

substantially amended by the linearly polarized light, even if it is not completely amended by plane polarization with a corrector plate 11. A laser beam with a wavelength of 650nm which carried out incidence to the half mirror 3 penetrates a half mirror 3, is made into parallel light by the collimator lens 4, and carries out incidence to the 2nd optical element 5. A laser beam with a wavelength of 650nm which carried out incidence to the 2nd optical element 5 is the 2nd optical element 5, without being optical influenced in any way, as it is, it penetrates, is condensed with an objective lens 6, and convergent radiotherapy of it is carried out to signal recording surface 7a through the substrate 7 of a magneto-optic-recording medium. The diameter of a spot of a laser beam with a wavelength of 650nm irradiated by signal recording surface 7a is about 0.9(allowable error**0.1) mum. One half reflection even of the half mirror 3 is carried out by return and the half mirror 3 through an objective lens 6, the 2nd optical element 5, and a collimator lens 4, and incidence of the laser beam with a wavelength of 650nm reflected by signal recording surface 7a is carried out to Wollaston prism 8. And with Wollaston prism 8, it separates into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component, and is detected by the photodetector 9. An optical MAG signal is detected by calculating the difference of the laser beam LM1 of only S polarization component, and the laser beam LM3 of only P polarization component on the strength, and a tracking error signal and a focal error signal are obtained by detecting and calculating the intermingled laser beam LM2 of S polarization component and P polarization component.

[0039] In this application, holding linearly polarized light nature substantially, since the corrector plate 11 was formed between the 1st optical element 2 and a half mirror 3, incidence of the reflected light in the optical recording medium 7 which is a magneto-optic-recording medium can be carried out to Wollaston prism 8, and a property does not fall in record and/or playback of the signal to a magneto-optic-recording medium.

[0040] In addition, when reproducing DVD which is a disk only for [of 0.6mm of substrate thickness] playbacks, even if it uses the optical pickup equipment 10 which does not need to take into consideration especially the plane of polarization of the laser beam irradiated, and is applied to the invention in this application, it cannot be overemphasized that signal regeneration is possible. With reference to drawing 13 , playback actuation of CD-R which is the optical disk of 1.2mm of substrate thickness is explained. When CD-R is reproduced, the selection drive of the 2nd semiconductor laser 1B which generates a laser beam with a wavelength of 780nm is carried out by the laser drive circuit 100. Consequently, a laser beam with a wavelength of 780nm is reflected by the 1st optical element 2 as a laser beam which has the same optical axis as the reflected light in the 1st optical element 2 of a laser beam with a wavelength of 650nm. Then, although incidence of the laser beam with a wavelength of 780nm is carried out to a corrector plate 11, since elliptically polarized light is amended to the linearly polarized light depending on the wavelength of a laser beam, the corrector plate 11 which consists of Xtal does not usually restrict that the elliptically polarized light of a laser beam with a wavelength of 780nm is also amended by the linearly polarized light in the thickness set up so that the elliptically polarized light of a laser beam with a wavelength of 650nm might be amended to the linearly polarized light. Therefore, a laser beam with a wavelength of 780nm may penetrate a corrector plate 11 with elliptically polarized light, is amended by the linearly polarized light and may penetrate a corrector plate 11. Then, a laser beam with a wavelength of 780nm penetrates a half mirror 3, is made into parallel light by the collimator lens 4, and carries out incidence to the 2nd optical element 5. As the laser beam with a wavelength of 780nm which carried out incidence to the 2nd optical element 5 gave [above-mentioned] explanation, it is shaded substantially, and the predetermined inner circumference section is diffracted by the outside of an optical axis, and it carries out incidence of the predetermined periphery section to an objective lens 6. It is condensed and a laser beam with a wavelength of 780nm which carried out incidence to the objective lens 6 is irradiated by signal recording surface 77a through the substrate 77 of an optical disk. The diameter of a spot of the laser beam irradiated by signal recording surface 77a is about 1.5(allowable error**0.1) mum. Then, as drawing 12 R> 2 explained, a photodetector 9 irradiates. In this case, although the reflected light in an optical recording medium 77 is separated into the laser

beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8 when amended by the linearly polarized light with a corrector plate 11 It is not separated into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8 when not amended by the linearly polarized light with a corrector plate 11. When separated into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8, total of the reinforcement of the laser beam LM1 of only S polarization component, the laser beam LM3 of only P polarization component, and the intermingled laser beam LM2 of S polarization component and P polarization component serves as original signal strength. However, even if it all does not detect three laser beams LM1, LM2, and LM3, only the intermingled laser beam LM2 of S polarization component and P polarization component is detected, and it is good also as a regenerative signal.

[0041] Although CD-R is reproduced by the actuation explained by drawing 13 , it cannot be overemphasized that CD is similarly refreshable. The 1st optical element 2 may make in agreement the optical axis of a laser beam with a wavelength of 410nm from which not only the thing that makes in agreement the optical-axis gap with a laser beam of with a wavelength of 650nm and the laser beam with a wavelength of 780nm from which the optical axis shifted but the optical axis shifted, a laser beam with a wavelength of 650nm, and a laser beam with a wavelength of 780nm. That is, with reference to (a) of drawing 14 , other 1st optical element 140 consists of the glass 142 which has the 1st layer 141 in one principal plane, the glass 144 which has the 2nd layer 143 in one principal plane, and the glass 146 which has the 3rd layer 145 in one principal plane, and the 1st layer 141, the 2nd layer 142, and the 3rd layer 145 are constituted so that it may become parallel mutually. It is refracted and makes the laser beam LB1 with a wavelength of 650nm reflected in the 2nd layer 143, and the laser beam LB2 with a wavelength of 780nm refracted in the 2nd layer 143 the laser beam of the same optical axis as a laser beam LB7 while the 1st layer 141 reflects the laser beam LB6 with a wavelength of 410nm, makes it a laser beam LB7 and penetrates the laser beam LB1 with a wavelength of 650nm and the laser beam LB2 with a wavelength of 780nm. Moreover, it is refracted and carries out incidence of the laser beam LB2 with a wavelength of 780nm reflected in the 3rd layer 145 to the 1st layer 141 while the 2nd layer 143 reflects the laser beam LB1 with a wavelength of 650nm, it is made it to carry out incidence to the 1st layer 141 and it penetrates the laser beam LB2 with a wavelength of 780nm. Furthermore, the 3rd layer 145 reflects the laser beam LB2 with a wavelength of 780nm.

[0042] The example of the 1st layer 141 which constitutes other 1st optical element 140 is explained with reference to (b) of drawing 14 . The 1st layer 141 is the cascade screen which carried out the laminating of the four layers for the 2nd thin film 1411 which consists the 1st thin film 1410 which consists of MgF2 of three layers and TiO2 by turns. Moreover, the thickness per layer of the 1st thin film 1410 is set to 65.2nm. Moreover, the thickness of the 2nd thin film 1411 is set to 333nm.

[0043] As shown in drawing 16 , the optical property to a laser beam with a wavelength [of the 1st layer 141 constituted as mentioned above] of 410nm, a laser beam with a wavelength of 650nm, and a laser beam with a wavelength of 780nm reflects most laser beams with a wavelength of 410nm, and penetrates most of a laser beam with a wavelength of 650nm and a laser beam with a wavelength of 780nm. In this case, as the incident angle to the 1st layer 141 also influences and it is shown in drawing 3 and 4, when the incident angle theta is set up, the case of drawing 16 is also theta= 48 degrees.

[0044] Moreover, the example of the 2nd layer 143 is the same as what was shown in above-mentioned drawing 5 R> 5. Furthermore, the 3rd layer 145 consists of aluminum (aluminum), and the thickness is about 100nm. In this case, the 3rd layer 145 reflects a laser beam with a wavelength of 780nm which penetrated the 1st layer 141 and the 2nd layer 143 80% or more. When reflected by other 1st optical element 140 shown in drawing 14 R> 4, a laser beam turns into elliptically polarized light, but in this case, that thickness is set up so that a corrector plate 11 may amend at least the laser beam which needs linearly polarized light nature to the linearly polarized light.

[0045] Moreover, in the optical pickup equipment 10 of this application, if what divides the laser beam of the linearly polarized light into the laser beam in which the laser beam of only S polarization component, the laser beam of only P polarization component, and S polarization component and P polarization component were intermingled has the same function not only as a Wollaston prism but this, anything, it will be good and will call the optical element which has the same function as a Wollaston prism the 3rd optical element.
It explains referring to drawing about the gestalt of operation of the 2nd of gestalt this invention of the 2nd operation. The optical pickup equipment concerning the invention in this application may be optical pickup equipment 170 shown not only in the optical pickup equipment 10 shown in drawing 1 of the gestalt of the 1st operation but in drawing 17 . Optical pickup equipment 170 is equipped with the light source 1, the 1st optical element 12, the 1st corrector plate 13, a collimator lens 4, the 2nd optical element 5, an objective lens 6, the 2nd corrector plate 14, Wollaston prism 8, and a photodetector 9. Since it is the same as drawing 1 about the light source 1, a collimator lens 4, the 2nd optical element 5, an objective lens 6, Wollaston prism 8, and a photodetector 9, the explanation is omitted. The 1st optical element 12 carries out the abbreviation one half transparency of the reflected light in an optical recording medium 7 (or 77), and leads it to a photodetector 9 while it amends an optical-axis gap of two laser beams and leads a laser beam to an optical recording medium 7 (or 77) by carrying out abbreviation one half reflection of a laser beam with a wavelength of 650nm generated by 1st semiconductor laser 1A and the laser beam with a wavelength of 780nm generated by 2nd semiconductor laser 1B. Also in the 1st optical element 12, it becomes the laser beam of elliptically polarized light by carrying out abbreviation one half reflection of the laser beam.
[0046] The 1st optical element 12 is explained to a detail with reference to drawing 18 , and 19 and 20. The 1st optical element 12 consists of glass 122 which formed the 1st layer 121 in one principal plane, and glass 124 which formed the 2nd layer 123 in one principal plane, and the 1st layer 121 and 2nd layer 123 are constituted so that it may become parallel mutually. The 1st layer 121 carries out abbreviation one half reflection of the laser beam LB1 with a wavelength of 650nm, and it almost penetrates the laser beam LB2 with a wavelength of 780nm while it carries out abbreviation one half transparency. Moreover, the 2nd layer 123 almost penetrates the laser beam LB1 with a wavelength of 650nm, carries out abbreviation one half reflection of the laser beam with a wavelength of 780nm, and carries out abbreviation one half transparency. That is, the 1st layer 121 has the optical property shown in drawing 25 , and the 2nd layer 123 has the optical property shown in drawing 26 R> 6.
[0047] With reference to drawing 19 , abbreviation one half reflection is carried out in the 1st layer 121, the laser beam LB1 with a wavelength of 650nm which carried out outgoing radiation from the light source 1 turns into a laser beam LB8, and abbreviation one half penetrates glass 122, the 2nd layer 123, and glass 124, and serves as a laser beam LB9 (refer to (a) of drawing 19). It is further reflected with an optical recording medium 7, abbreviation one half reflection is carried out in return and the 1st layer 121 to the 1st optical element 12 as a laser beam LB10, and the reflected laser beam LB8 turns into a laser beam LB11. And abbreviation one half penetrates the 1st layer 121, glass 122, the 2nd layer 123, and glass 124, and serves as a laser beam LB12 (refer to (b) of drawing 19). In optical pickup equipment 170, a photodetector 9 detects laser beam lb12, and a signal is reproduced.
[0048] Moreover, with reference to drawing 20 , the 1st layer 121 is almost penetrated, abbreviation one half reflection is carried out in the 2nd layer 123, and the laser beam LB2 with a wavelength of 780nm which carried out outgoing radiation from the light source 1 is refracted in the 1st layer 121, and turns into a laser beam LB8 and a laser beam of the same optical axis. Moreover, the remaining abbreviation one half refracted in the 2nd layer 123 penetrates glass 124, and serves as a laser beam LB9 (refer to (a) of drawing 20). It is further reflected with an optical recording medium 77, and the laser beam which was reflected in the 2nd layer 123 and became the same optical axis as a laser beam LB8 almost penetrates return and the 1st layer 121 to the 1st optical element 12 as a laser beam LB13, abbreviation one half reflection is carried out in the 2nd layer 123, and abbreviation one half penetrates the 2nd layer 123. The abbreviation one half reflected in the 2nd layer 123 penetrates glass 122, is refracted in the 1st layer 121, and serves as a laser beam LB14. On the other hand, the abbreviation one half which

penetrated the 2nd layer 123 penetrates glass 124, and serves as a laser beam LB15 (refer to (b) of drawing 20). In optical pickup equipment 170, a photodetector 9 detects a laser beam LB15, and a signal is reproduced.

[0049] As mentioned above, as explained, while respond to wavelength, penetrating alternatively, and the 1st optical element's 12 reflecting the laser beam LB1 with a wavelength of 650nm and the laser beam LB2 with a wavelength of 780nm from which the optical axis shifted, amending two optical-axis gaps and leading them to optical recording media 7 or 77, the reflected light in optical recording media 7 or 77 is led to a photodetector 9. With reference to drawing 21 and 22, the example of the 1st layer 121 which constitutes the 1st optical element 12, and the 2nd layer 123 is explained. It is the cascade screen which carried out the laminating of the four layers for the 2nd thin film 1211 which consists the 1st thin film 1210 with which the 1st layer 121 consists of TiO2 with reference to drawing 2121 of five layers and MgF2 by turns. In this case, the thickness of the 1st thin film 1210 sets the refractive index of TiO2 to 2.7, and it is 40.7nm, and the thickness of the 2nd thin film 1211 sets the refractive index of MgF2 to 1.38, and is 79.7nm.

[0050] Moreover, it is the cascade screen which carried out the laminating of the four layers for the 2nd thin film 1231 which consists the 1st thin film 1230 with which the 2nd layer 123 consists of Sb2S3 with reference to drawing 22 of four layers and MgF2 by turns. In this case, the thickness of the 1st thin film 1230 sets the refractive index of Sb2S3 to 3.0, and it is 36.7nm, and the thickness of the 2nd thin film 1231 sets the refractive index of MgF2 to 1.38, and is 79.7nm.

[0051] When it is reflected in the 1st layer 121 of the 1st optical element 12 and the laser beam LB1 with a wavelength of 650nm turns into a laser beam LB8, the phase contrast of P polarization component and S polarization component becomes 16 degrees. Moreover, when the laser beam LB2 with a wavelength of 780nm penetrates the 1st layer 121 of the 1st optical element 12, the phase contrast of P polarization component and S polarization component is 13.8 degrees. When reflecting in the 2nd layer 123, the phase contrast of P polarization component and S polarization component is 6.0 degrees, and when the laser beam reflected in the 2nd layer 123 penetrates the 1st layer 121 again, the phase contrast of P polarization component and S polarization component is 13.8 degrees. Therefore, when the laser beam LB2 with a wavelength of 780nm carries out incidence to the 1st optical element 12 and carries out outgoing radiation of the 1st optical element 12 as a laser beam of the same optical axis as a laser beam LB8, the phase contrast of P polarization component and S polarization component is 33.6 degrees. Therefore, the thickness is determined like the case of the gestalt of the 1st operation, and the 1st corrector plate 13 is set to mu(68.8+72xm) m (m= 0, 1 and 2, ...) so that 16 phase contrast produced at least by reflecting the laser beam LB1 with a wavelength of 650nm by the 1st optical element 12 may be amended. Moreover, since the phase contrast produced in case it is reflected with an optical recording medium 7, and the laser beam LB1 with a wavelength of 650nm penetrates return and the 1st optical element 12 to the 1st optical element 12 as a laser beam LB10 and turns into a laser beam LB12 is 17.8 degrees, the thickness of the 2nd corrector plate 14 is set to mu(68.4+72xm) m (m= 0, 1 and 2, ...). The concrete ingredient which constitutes the 1st corrector plate 13 and the 2nd corrector plate 14 is Xtal.

[0052] In optical pickup equipment 170, while being able to irradiate the laser beam of the linearly polarized light by using the 1st corrector plate 13 and 2nd corrector plate 14 at an optical recording medium 7, the linearly polarized light nature of the laser beam reflected with the optical recording medium 7 is held, and incidence can be carried out to Wollaston prism 8. That is, the 1st corrector plate 13 amends the elliptically polarized light produced by being reflected by the 1st optical element 12, when the laser beam reflected with the optical recording medium 7 penetrates the 1st corrector plate 13 from an objective lens 6 side to the 1st optical element 12 side, it changes to elliptically polarized light and the 2nd corrector plate 14 amends the phase contrast further produced by penetrating the 1st optical element 12. Thereby, also in optical pickup equipment 170, it becomes record of the signal to a magneto-optic-recording medium, and/or reproducible, without reducing a property.

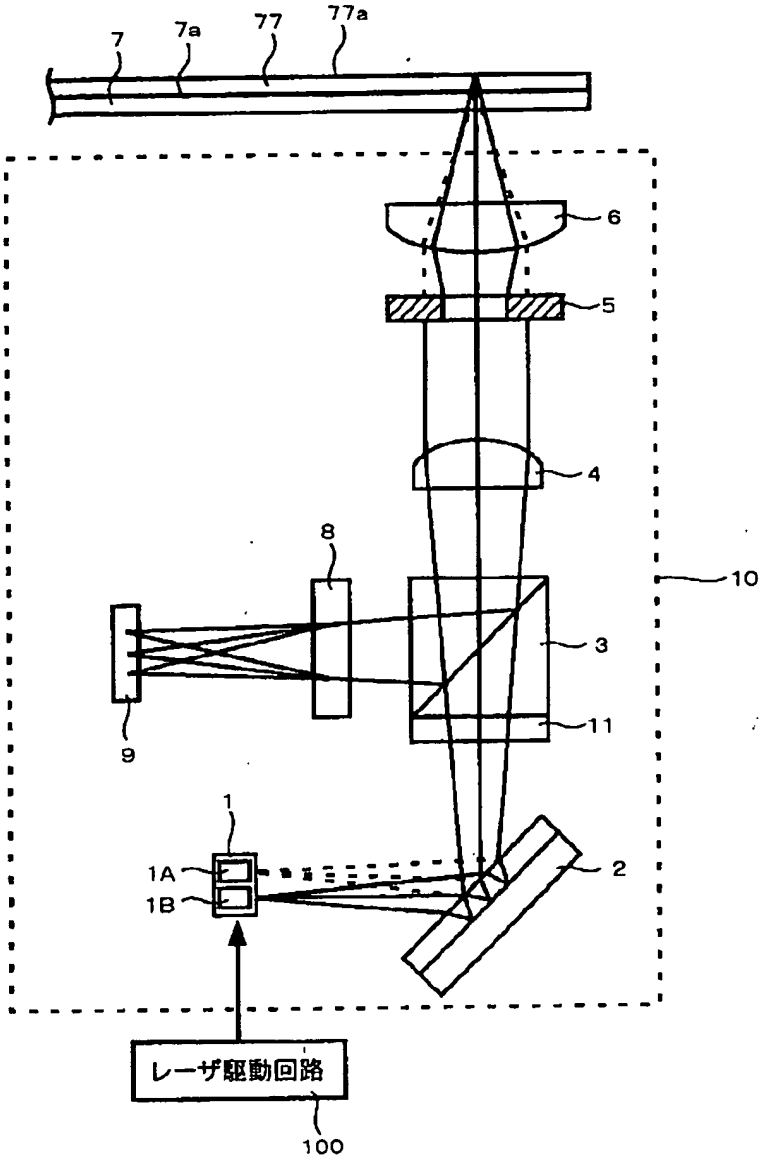
[0053] With reference to drawing 23 , playback actuation of the magneto-optic-recording medium which is the optical disk of 0.6mm of substrate thickness is explained. When a magneto-optic-recording medium is reproduced, the selection drive of the 1st semiconductor laser 1A which generates a laser

beam with a wavelength of 650nm by the laser drive circuit 100 is carried out. Consequently, as the laser beam with a wavelength of 650nm gave [above-mentioned] explanation, abbreviation one half reflection is carried out in the 1st layer 121 of the 1st optical element 12. A laser beam with a wavelength of 650nm reflected by the 1st optical element 12 is amended by the linearly polarized light from elliptically polarized light with the 1st corrector plate 13, and carries out incidence to a collimator lens 4. In this case, what is necessary is to just be substantially amended by the linearly polarized light, even if it is not completely amended by plane polarization with the 1st corrector plate 13. A laser beam with a wavelength of 650nm which carried out incidence to the collimator lens 4 is made into parallel light by the collimator lens 4, and carries out incidence to the 2nd optical element 5. A laser beam with a wavelength of 650nm which carried out incidence to the 2nd optical element 5 is the 2nd optical element 5, without being optical influenced in any way, as it is, it penetrates, is condensed with an objective lens 6, and convergent radiotherapy of it is carried out to signal recording surface 7a through the substrate 7 of a magneto-optic-recording medium. The diameter of a spot of a laser beam with a wavelength of 650nm irradiated by signal recording surface 7a is about 0.9(allowable error**0.1) mum. Even the 1st corrector plate 13 changes from the linearly polarized light to elliptically polarized light with return and the 1st corrector plate 13 through an objective lens 6, the 2nd optical element 5, and a collimator lens 4, and incidence of the laser beam with a wavelength of 650nm reflected by signal recording surface 7a is carried out to the 1st optical element 12. Abbreviation one half penetrates the 1st optical element 12, and carries out incidence of the reflected light which carried out incidence to the 1st optical element 12 to the 2nd corrector plate 14. The reflected light which carried out incidence to the 2nd corrector plate 14 is changed into the linearly polarized light from elliptically polarized light with the 2nd corrector plate 14, and carries out incidence to Wollaston prism 8. And with Wollaston prism 8, it separates into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component, and is detected by the photodetector 9. Also in this case, an optical MAG signal is detected by calculating the difference of the laser beam LM1 of only S polarization component, and the laser beam LM3 of only P polarization component on the strength, and a tracking error signal and a focal error signal are obtained by detecting and calculating the intermingled laser beam LM2 of S polarization component and P polarization component.

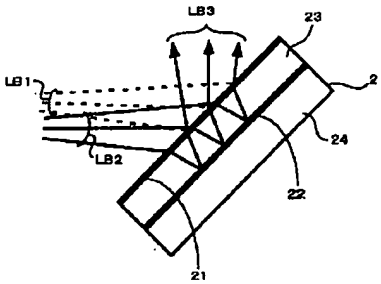
[0054] In addition, when reproducing DVD which is a disk only for [of 0.6mm of substrate thickness] playbacks, even if it uses the optical pickup equipment 170 which does not need to take into consideration especially the plane of polarization of the laser beam irradiated, and is applied to the invention in this application, it cannot be overemphasized that signal regeneration is possible. With reference to drawing 24 , playback actuation of CD-R which is the optical disk of 1.2mm of substrate thickness is explained. When CD-R is reproduced, the selection drive of the 2nd semiconductor laser 1B which generates a laser beam with a wavelength of 780nm is carried out by the laser drive circuit 100. Consequently, abbreviation one half is reflected as a laser beam in which a laser beam with a wavelength of 780nm has the same optical axis as the reflected light in the 1st optical element 12 of a laser beam with a wavelength of 650nm by the 1st optical element 12. Then, although incidence of the laser beam with a wavelength of 780nm is carried out to the 1st corrector plate 13, since elliptically polarized light is amended to the linearly polarized light depending on the wavelength of a laser beam, the corrector plate 13 which consists of Xtal does not usually restrict that the elliptically polarized light of a laser beam with a wavelength of 780nm is also amended by the linearly polarized light in the thickness set up so that the elliptically polarized light of a laser beam with a wavelength of 650nm might be amended to the linearly polarized light. Therefore, a laser beam with a wavelength of 780nm may penetrate the 1st corrector plate 13 with elliptically polarized light, is amended by the linearly polarized light and may penetrate the 1st corrector plate 13. Then, a laser beam with a wavelength of 780nm is made into parallel light by the collimator lens 4, and carries out incidence to the 2nd optical element 5. As the laser beam with a wavelength of 780nm which carried out incidence to the 2nd optical element 5 gave [above-mentioned] explanation, it is shaded substantially, and the predetermined inner circumference section is diffracted by the outside of an optical axis, and it carries out incidence of the

predetermined periphery section to an objective lens 6. It is condensed and a laser beam with a wavelength of 780nm which carried out incidence to the objective lens 6 is irradiated by signal recording surface 77a through the substrate 77 of an optical disk. The diameter of a spot of the laser beam irradiated by signal recording surface 77a is about 1.5(allowable error**0.1) mum. Then, as drawing 23 explained, a photodetector 9 irradiates. In this case, when amended by the linearly polarized light with the 1st corrector plate 13 Although the reflected light in an optical recording medium 77 changes to the linearly polarized light again with the 2nd corrector plate 14 and it is separated into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8 It is not separated into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8 when not amended by the linearly polarized light with the 1st corrector plate 13. When separated into the laser beam LM1 of only S polarization component, and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component by Wollaston prism 8, total of the reinforcement of the laser beam LM1 of only S polarization component, the laser beam LM3 of only P polarization component, and the intermingled laser beam LM2 of S polarization component and P polarization component serves as original signal strength. However, even if it all does not detect three laser beams LM1, LM2, and LM3, only the intermingled laser beam LM2 of S polarization component and P polarization component is detected, and it is good also as a regenerative signal.

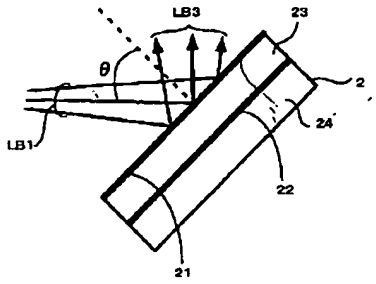
[0055] Although CD-R is reproduced by the actuation explained by drawing 24 , it cannot be overemphasized that CD is similarly refreshable. In addition, in optical pickup equipment 170, the 1st corrector plate 13 and the 2nd corrector plate 14 say what has the same function as the 1st corrector plate 13 as the 3rd optical element that what is necessary is just what has the same function not only as Xtal but the function which gave [above-mentioned] explanation, and say what has the same function as the 2nd corrector plate 14 as the 4th optical element. Moreover, the component divided into the laser beam LM1 of only S polarization component and the intermingled laser beam LM2 of the laser beam of only P polarization component, LM3 and S polarization component, and P polarization component says what has the same function as Wollaston prism 8 as the 5th optical element that what is necessary is just what has a function equivalent not only to Wollaston prism 8 but this.



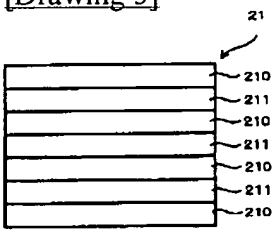
[Drawing 2]



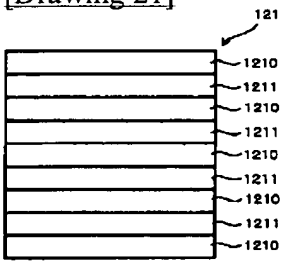
[Drawing 3]



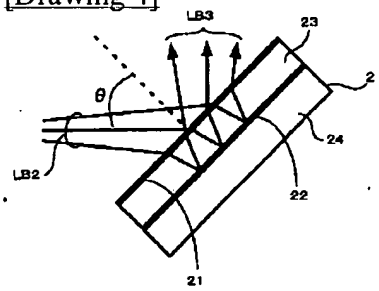
[Drawing 5]



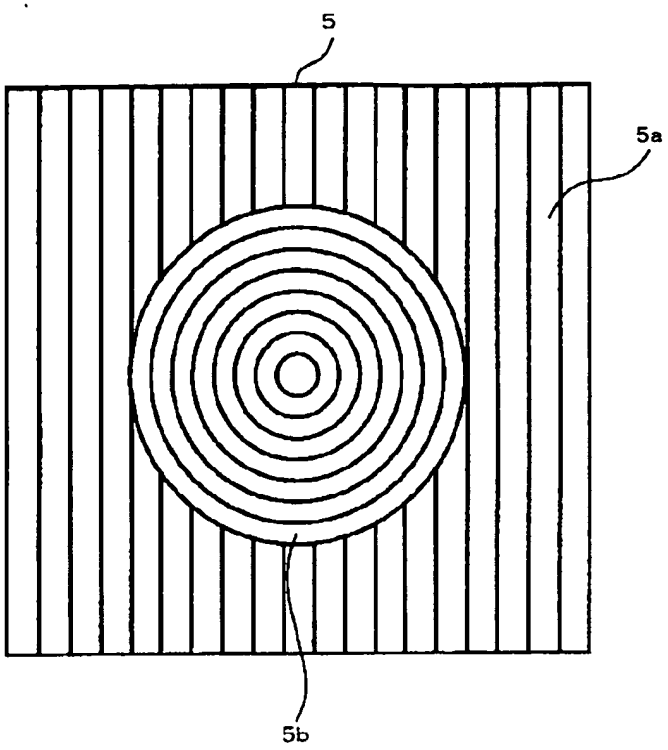
[Drawing 21]



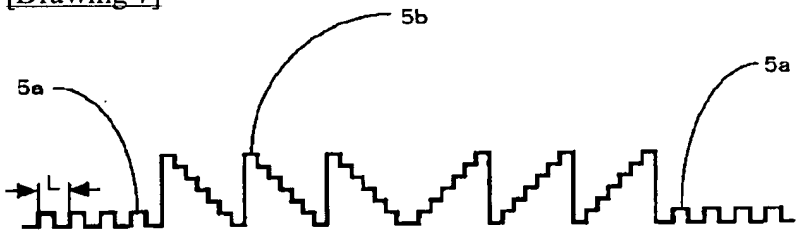
[Drawing 4]



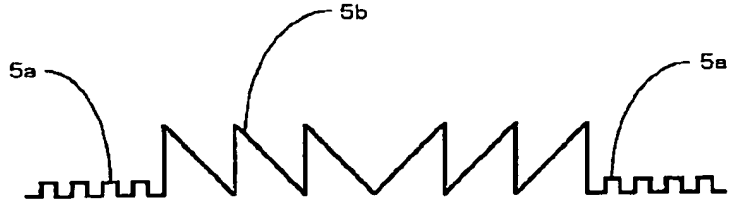
[Drawing 6]



[Drawing 7]

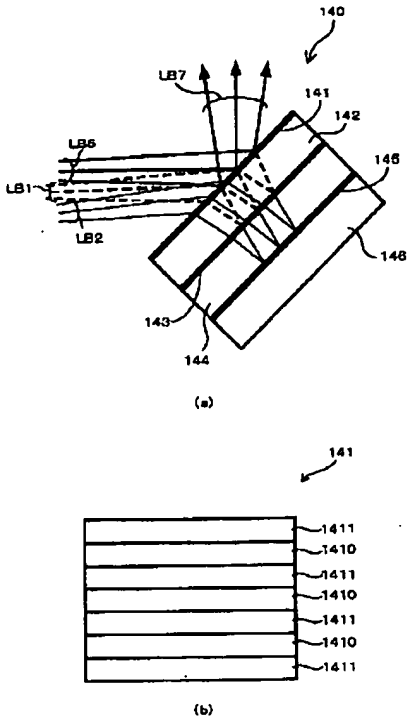


(a)

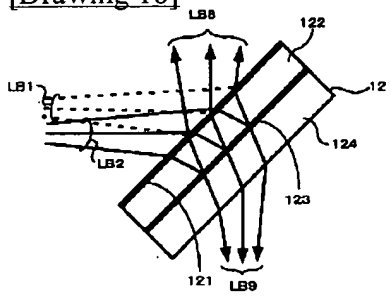


(b)

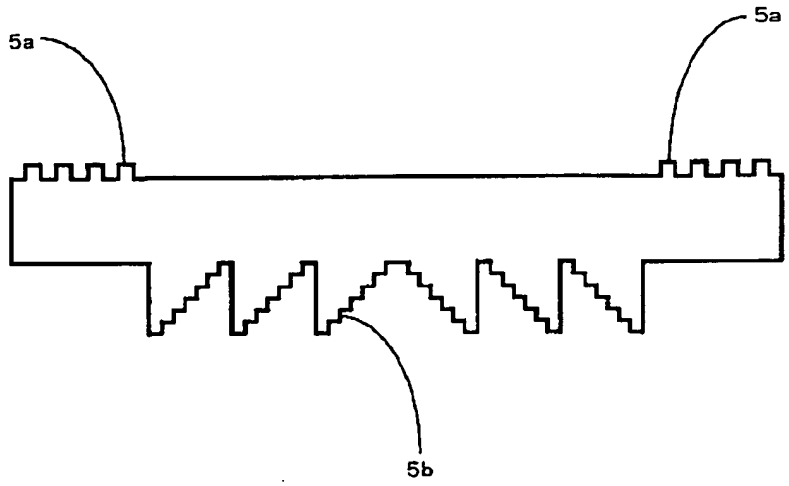
[Drawing 14]



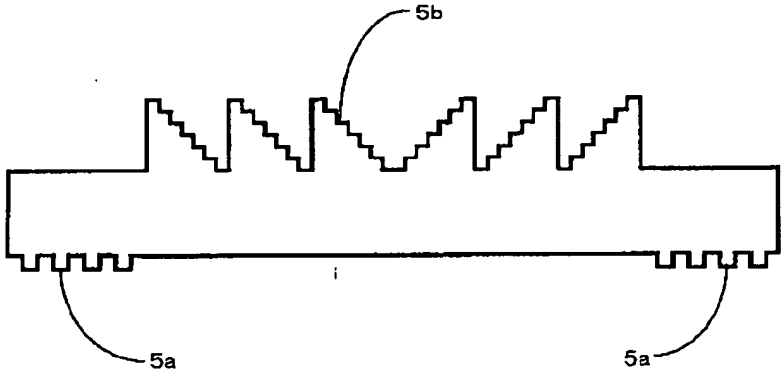
[Drawing 18]



[Drawing 8]

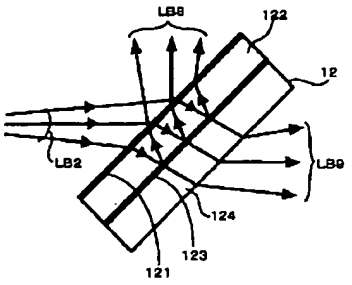


(a)

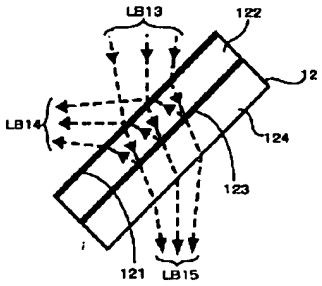


(b)

[Drawing 20]

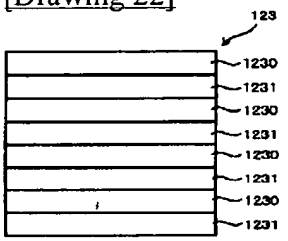


(a)

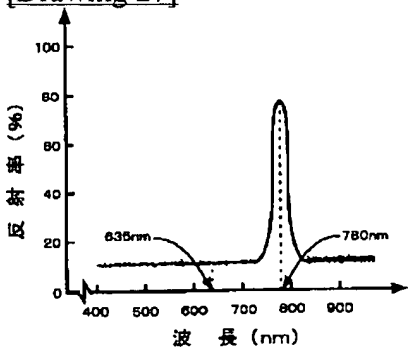


(b)

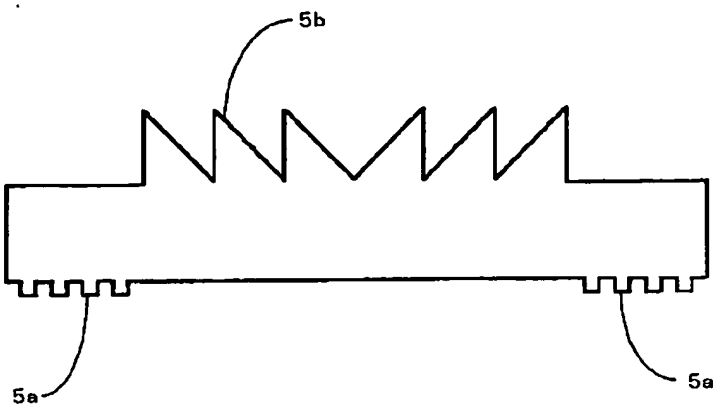
[Drawing 22]



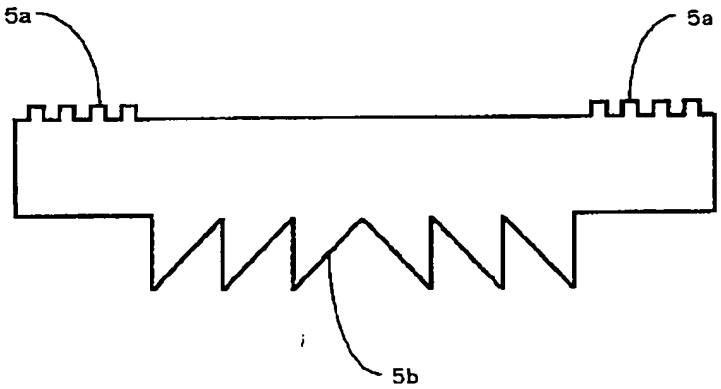
[Drawing 27]



[Drawing 9]

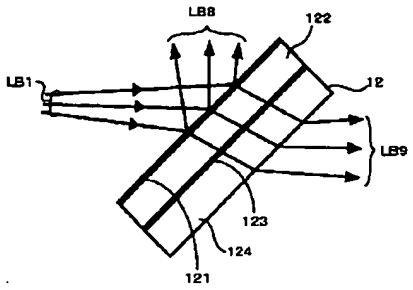


(a)

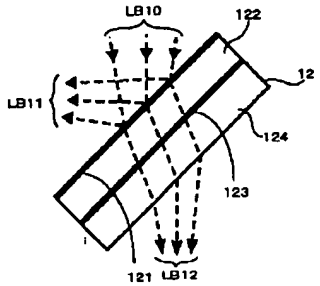


(b)

[Drawing 19]

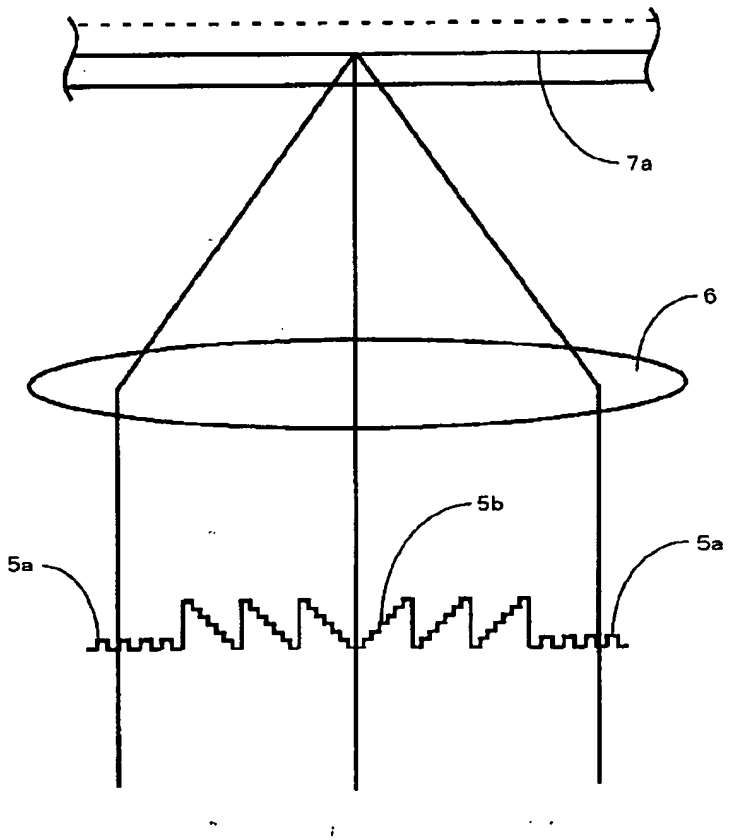


(a)

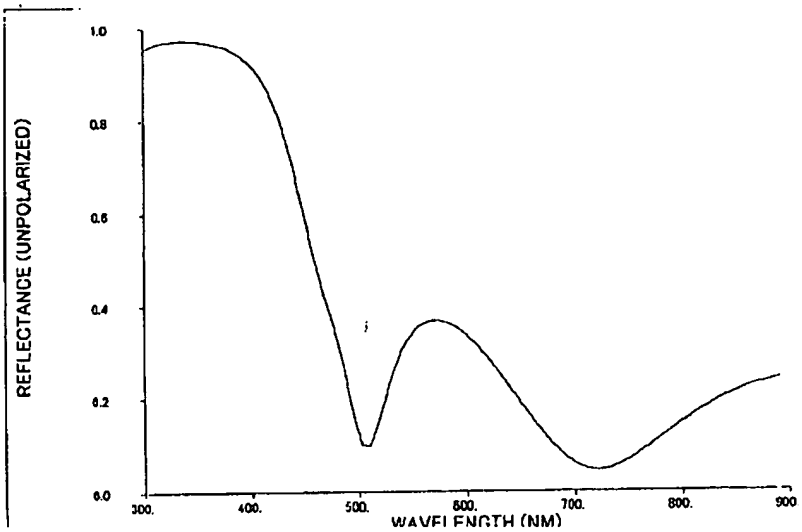


(b)

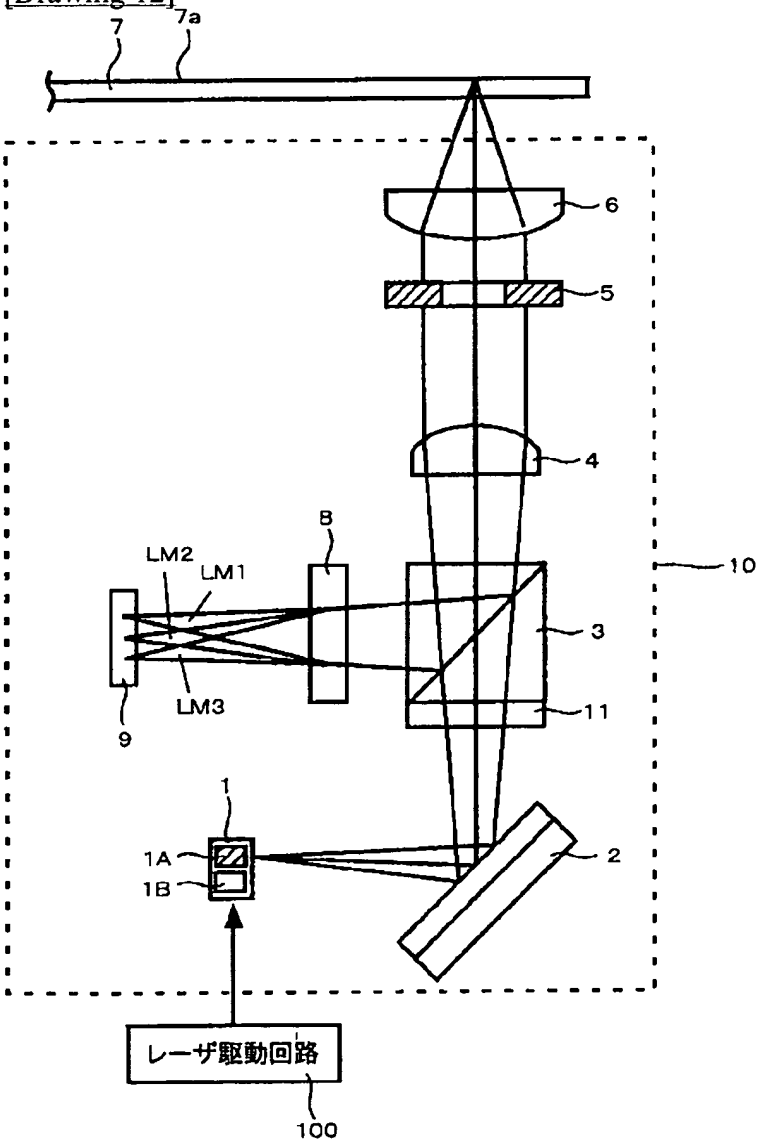
[Drawing 10]



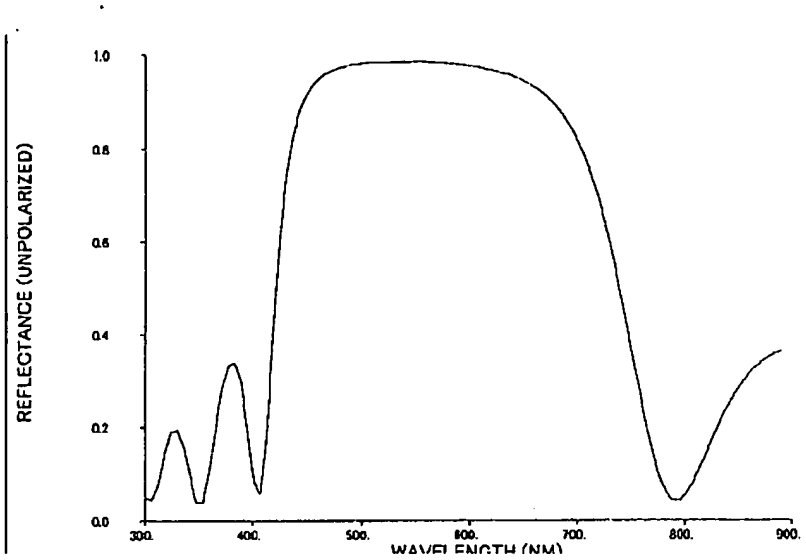
[Drawing 15]



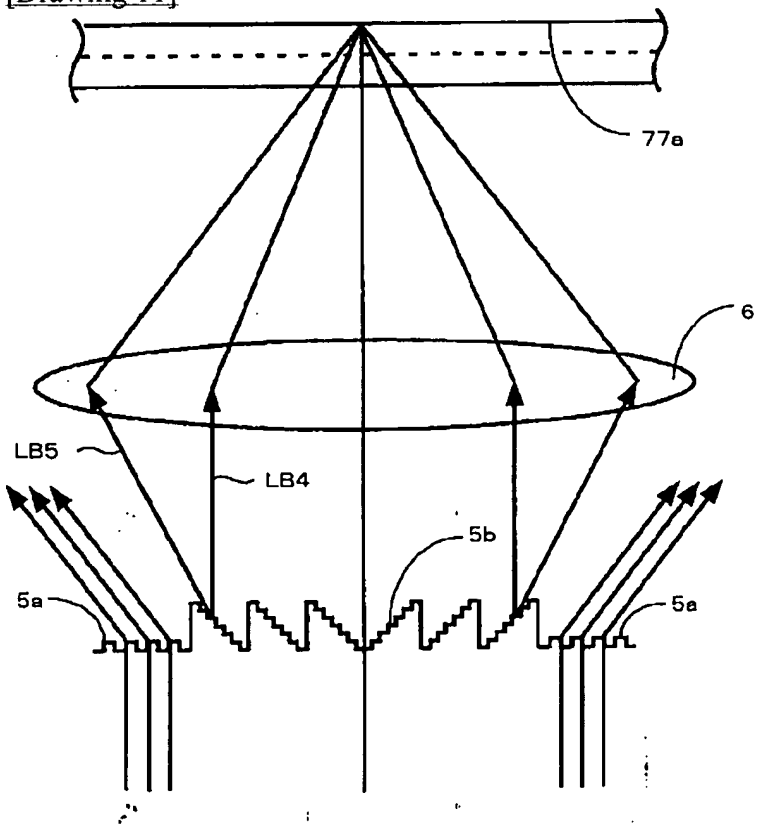
[Drawing 12]



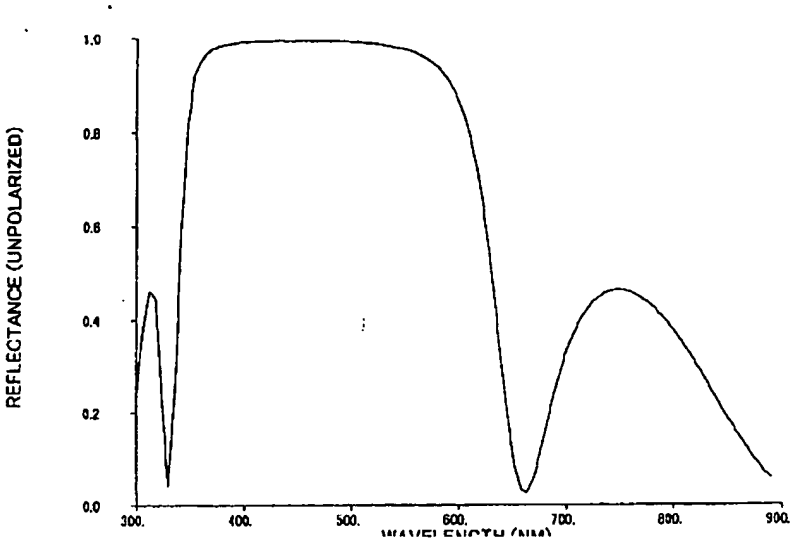
[Drawing 26]



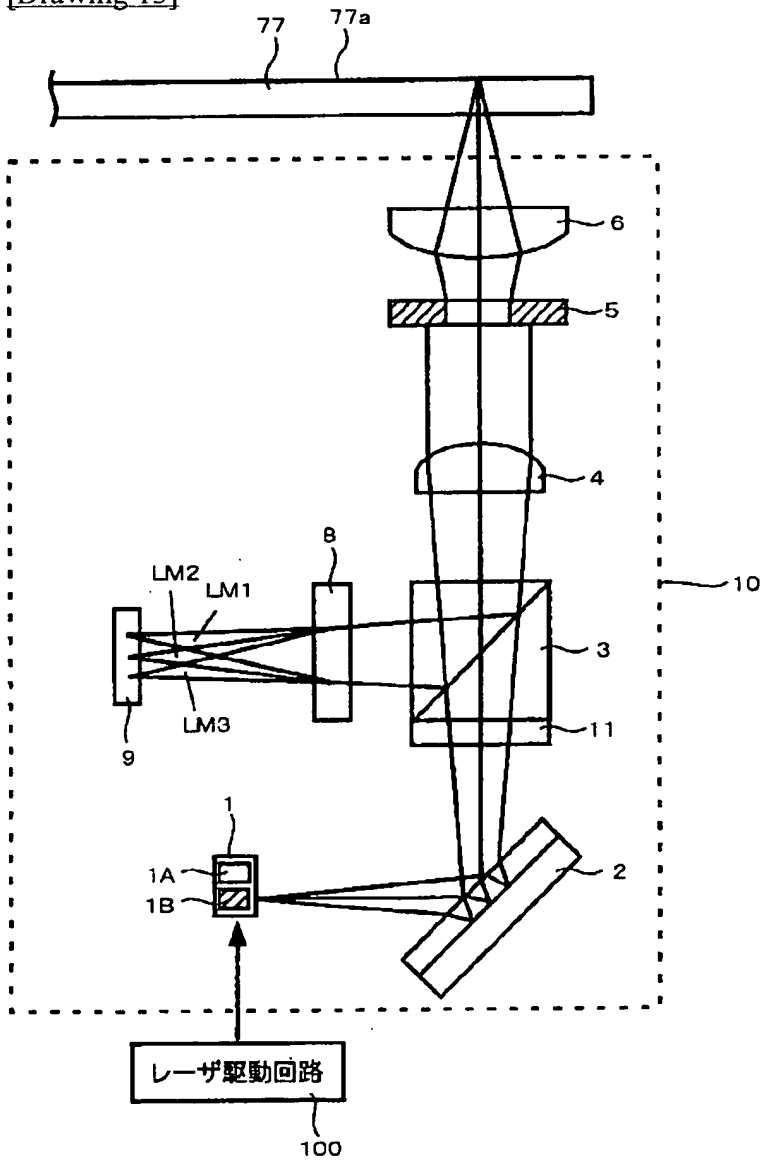
[Drawing 11]



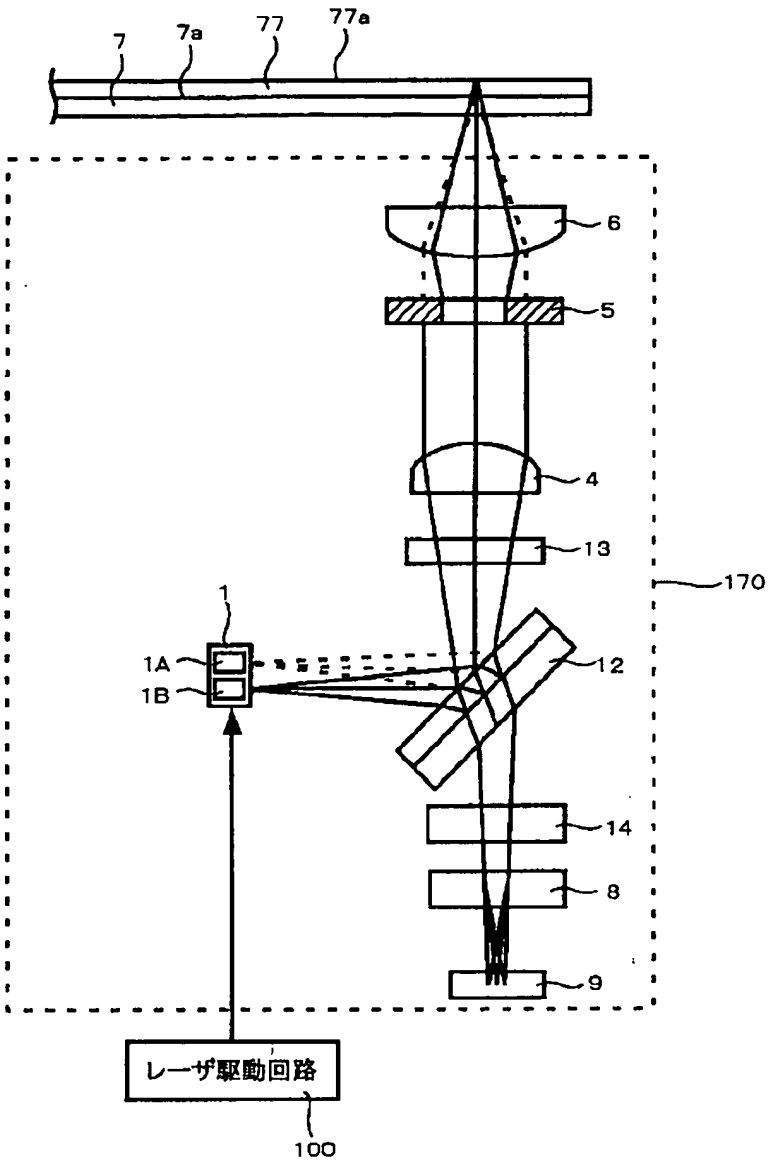
[Drawing 16]



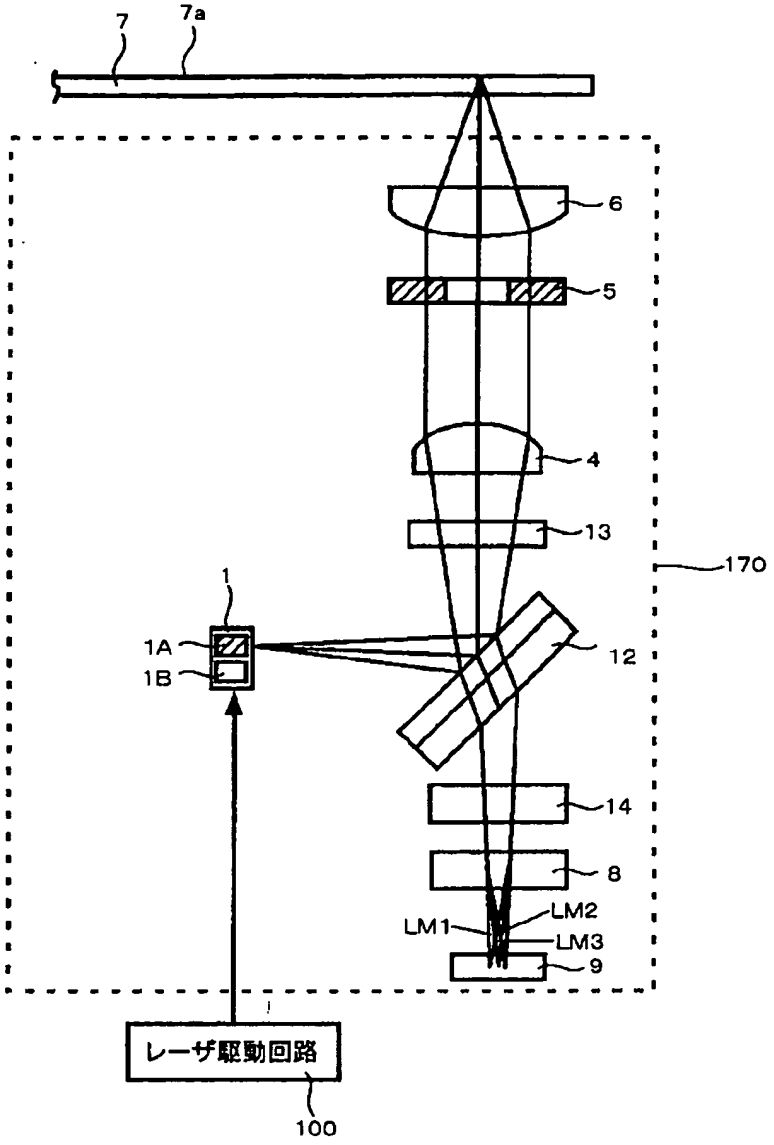
[Drawing 13]



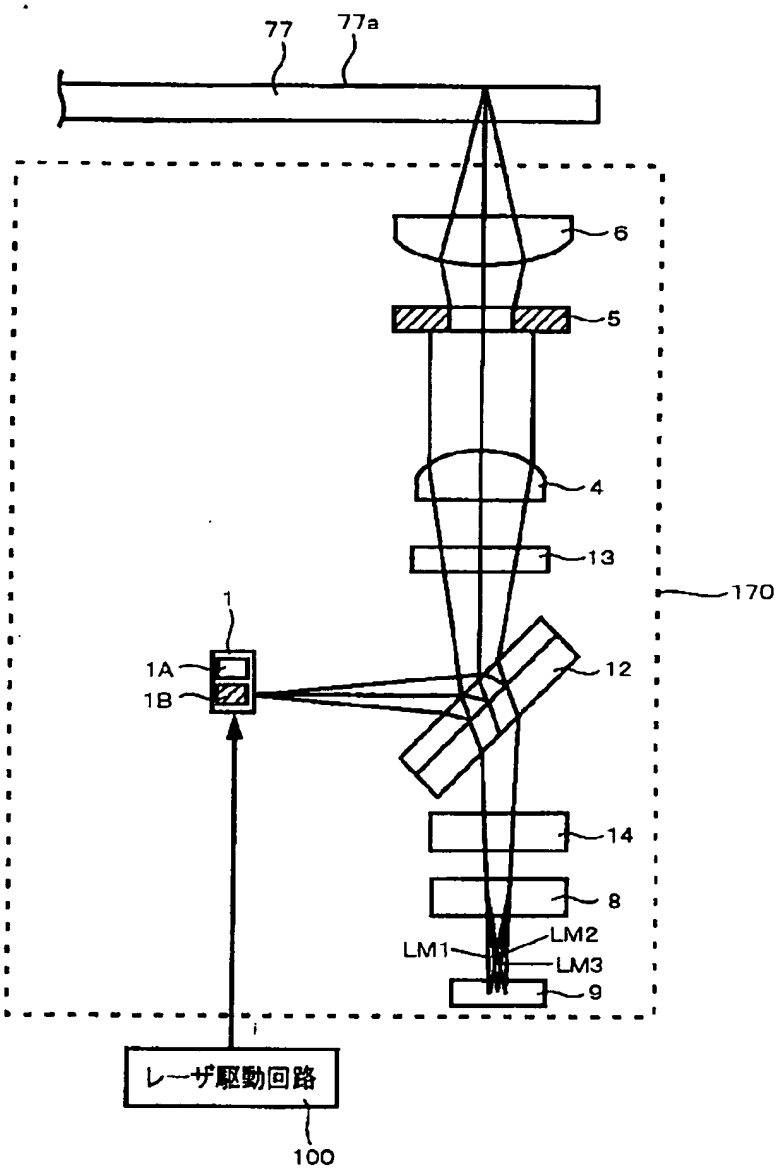
[Drawing 17]



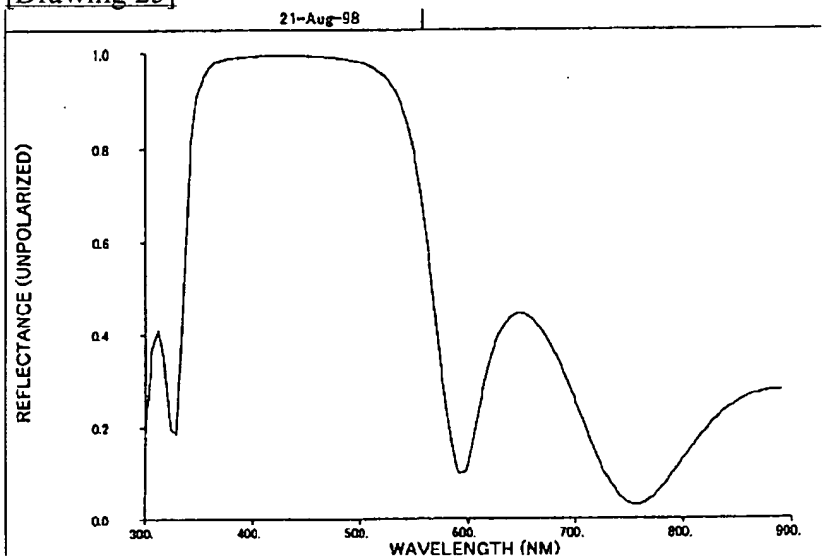
[Drawing 23]



[Drawing 24]


77
77a
6
5
4
13
170
1
1A
1B
12
14
8
LM1
LM2
LM3
9
レーザ駆動回路
100

[Drawing 25]


21-Aug-98
REFLECTANCE (UNPOLARIZED)
1.0
0.8
0.6
0.4
0.2
0.0
300.
400.
500.
600.
700.
800.
900.
WAVELENGTH (NM)